

distortion. Intracavity non-degenerate four wave mixing is used in a broad area semiconductor laser in the communications station to produce the return beam.

Degenerative four wave mixing entails three input waves having the same frequency. In non-generative four wave mixing, such as that taught by Applicant, by injecting a probe beam having a frequency, into two counter-propagating pump beams with a predetermined angle, the phase conjugate signal counter-propagating to the incident probe beam is generated as a result of the pump beam diffraction from the spatial grating of the carrier density caused by the interference between the other pump and probe beams and will be at a frequency not equal to the probe beam frequency. In Applicant's invention, this four wave mixing process occurs "intracavity," i.e., within the claimed broad area device.

Broad area is an important claimed limitation described by Applicant in the specification on page 6, lines 16-18. For example, Applicant states, "'broad area' will be used herein to indicate that the micro-phase conjugators are large aperture phase conjugators in a semiconductor device. An aperture may be defined as the acceptance opening or input of a phase conjugate system.....Broad area also indicates that the micro-phase conjugators are multimode (spatially)." Moreover, on page 11, lines 11-25, Applicant further describes the claimed broad area device by comparing conventional four wave mixing in one dimensional systems with his two-dimensional system. For example, Applicant states, "commercial broad area diodes are designed as thin rectangular gain stripes that are nominally 1000 to 2000 μ m long with 100 to 300 μ m wide by 1 to 2 μ m high emitter apertures." It is important to note that such conventional

devices spatially filter an atmospherically aberrated input beam, destroying the spatial information required to produce a spatially phase conjugated retro-beam. Because they destroy spatial information, such devices do not correct for atmospheric distortions. By contrast, Applicant's claimed device has an aperture defined not by the thin gain strip, but by the broad area defined from the top (i.e., from a top down perspective) of the RM-PCM 310 device as shown in Figure 3B of the application. Accordingly, Applicant's two-dimensional claimed broad area intracavity phase conjugator is capable of resolving a substantial portion of the spatial components of the input waveform of the interrogating beam to enable correction for an atmospherically aberrated beam.

Discussion of the Office Action

In the Office Action of November 20, 2002, the Examiner objected to claim 21 under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. She rejected claims 1-7, 9-14, 16, 17, 40, 41, and 45 under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi (US 4,949,056 A) in view of Vasil'ev et al. ("Phase-conjugation broad area twin-contact semiconductor laser," Applied Physics Letters, July 1997) and Pepper et al. (US 5,038,359 A). She rejected claims 8 and 15 under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi in view of Vasil'ev et al. as applied to claim 1 above, and further in view of Watanabe (US 5,920,588 A). She rejected claims 18, 19, and 21 under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi in view of Vasil'ev et al. She rejected claim 20 and 40-49 under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi et al. in view of Vasil'ev et al. She rejected claim 22 and 23

under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi in view of Vasil'ev. She rejected claims 24 and 26-33 under 35 U.S.C. §103(a) as being unpatentable over Watanabe in view of Vasil'ev et al. She rejected claim 25 under 35 U.S.C. §103(a) as being unpatentable over Watanabe et al. in view of Vasil'ev et al. She rejected claims 34 and 35 under 35 U.S.C. §103(a) as being unpatentable over Sharp et al. (US 5,317,442 A) in view of Vasil'ev et al. She rejected 36-39 under 35 U.S.C. §103(a) as being unpatentable over Sharp et al. in view of Pepper et al. and She rejected claim 25 under 35 U.S.C. §103(a) as being unpatentable over Watanabe et al. in view of Vasil'ev et al. In addition, she rejected 42-44 under 35 U.S.C. §103(a) as being unpatentable over Pepper et al. in view of Vasil'ev et al.

Discussion of rejection of Claim 21 under 35 U.S.C. § 112

As set forth above, claim 21 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention because of lack of antecedent basis. In light of the amendment to claim 18, such an issue is believed moot.

Discussion of Rejection of Claims 1-7, 9-14, 16, 17, 40, 41, and 45 under 35 U.S.C. §103(a)

Claims 1-7, 9-14, 16, 17, 40, 41, and 45 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi in view of Vasil'ev et al. and Pepper et al. Applicant respectfully traverses the rejection of claims 1, 40 and 41 and dependent claims thereof which contains the limitations of claim 1.

Regarding **claim 1**, the examiner indicates that Akkapeddi (Figure 1) disclose a system comprising: a transceiver 10 constructed to transmit an interrogating beam; and

a communication station capable of receiving the interrogating beam. The examiner further indicates that Akkapeddi includes a phase conjugator but does not specifically disclose that the communication station includes a plurality of intra-cavity phase conjugators arranged in an array. She states that, Vasil'ev et al. teach a broad area, intra-cavity phase conjugator, which may be used in a system to produce a phase conjugate beam such as the system disclosed by Akkapeddi. In addition, she states that Pepper et al. teach another type of phase conjugator, but also further suggests that phase conjugators may be arranged in an array. Finally, she states, "it would have been obvious to use the intra-cavity phase conjugator taught by Vasil'ev et al. in the system disclosed by Akkapeddi...and to further arrange the phase conjugators in an array as taught by Pepper et al. to provide a broader area for producing phase conjugation." Applicant respectfully traverses the rejection because: 1) there is no suggestion by the references themselves nor knowledge generally available to one of ordinary skill in the art to modify or to combine the reference teachings, 2) it is not proper to combine references where the references teach away from the combination, and 3) the references are not properly combinable or modifiable because their intended function is destroyed.

Applicant's present claim 1 is as follows:

1. A system comprising:

a transceiver constructed to transmit an interrogating beam;

a communications station capable of receiving said interrogating beam;

and

said communications station having a plurality of broad area intra-cavity phase conjugators arranged in an array.

First, Applicant respectfully submits that the rejection fails the obviousness test because there is no teaching, suggestion or motivation to combine or modify Akkapeddi and Vasil'ev et al. and Pepper et al. to make Applicant's claimed invention.

Under MPEP §2143.01, "[o]bviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art." *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The primary reference (**Akkapeddi**) teaches a phase conjugator that (as discussed previously in the Amendment mailed on August 21, 2002), needs a pump laser, a non-linear crystal, and a Raman amplifier as part of the system to return a phase conjugated interrogating laser beam back to the source. Like Applicant's invention, Akkapeddi addresses the issue of **two-dimensional spatial phase conjugation** for communicating through the atmosphere (i.e. to correct for atmospheric turbulence, [see first line of Akkapeddi's abstract, "An improved adaptive optics system is disclosed for correcting atmospheric phase aberrations"]), but is based on different physical phenomenology as opposed to Applicant's invention (i.e., Akkapeddi does not suggest or disclose the claimed **broad area, intra-cavity** electrically pumped micro-phase conjugator described by Applicant).

The secondary reference, i.e., **Vasil'ev**, teaches the generation of a self-pumped non-collinear four wave mixing signal inside of a broad area semiconductor laser diode (SLD) (i.e. a diode laser that lacks lateral confinement) in an external cavity configuration. The self-pumped four wave mixing signal is generated in a "spatially non-degenerate configuration", i.e., at an angle with respect to the pump beams so that it can be separated from the pump beams and fed back from an external mirror. Self-seeding of this type is a means to control the longitudinal mode characteristics (operating frequency characteristics) of a laser. The arrangement described in Vasil'ev exploits the temporal phase conjugation properties of the four-wave mixing process but **does not disclose or suggest true two-dimensional spatial phase conjugate to remove atmospheric distortions** of the input probe beam as taught by Akkapeddi as well as by Applicant. This last point is explicitly made in Vasil'ev, on page 42, in the second to last paragraph, wherein the authors state, "It should be noted that strictly speaking the "conjugate" signal generated is not the "phase conjugate" of the input beam, because of the "filtering" action of the waveguide of the SLD. In view of this SLD's are not truly suitable for turbulence aberration correction....."

Pepper et al., describes a phase conjugate apparatus that is capable of being arranged in an array.

Therefore, Applicant respectfully submits that one skilled in the art would not be motivated to combine or modify the inventions in Vasil'ev and Akkapeddi to create an array as taught in Pepper in order to make Applicant's invention, because a key feature (e.g., to remove turbulence aberrations) would be lost in the primary reference

(Akkapeddi) that is also taught by Applicant and because the cited references are based on different phenomenology with respect to Applicant's.

Second, Applicant respectfully submits that the rejection fails the obviousness test because it is improper to combine references where the references teach away from their combination.

Under MPEP §2145 (X)(D)(2): "[i]t is improper to combine references where the references teach away from their combination." *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983)

Again, the primary reference (Akkapeddi) addresses communication through the atmosphere by correcting for turbulence aberrations with his phase conjugation technique (See first line of Akkapeddi's abstract, "An improved adaptive optics system is disclosed for correcting atmospheric phase aberrations"). Vasil'ev teaches that **SLD's** (i.e., Semiconductor Laser Diodes that are taught in his apparatus) **are not suitable for turbulence aberration correction**. As shown above, the authors In Vasil'ev state, "It should be noted that strictly speaking the "conjugate" signal generated is not the "phase conjugate" of the input beam, because of the "filtering" action of the waveguide of the SLD. In view of this SLD's are not truly suitable for turbulence aberration correction....."

Therefore, Applicant submits that it is improper to combine the primary reference Akkapeddi as mandated by MPEP §2145 (X)(D)(2) with Vasil'ev et al. because the secondary reference (Vasil'ev) teaches away from using his device in an application such as that taught by Akkapeddi.

Third, Applicant submits that the rejection also fails the obviousness test because the combination of the cited references would destroy their intended function. The CCPA and the Federal Circuit have consistently held that:

“when a §103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, such a proposed modification is not proper and the prima facie case of obviousness can not be properly made.” *In re Gordon*, 733 F. 2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Again, like Applicant’s invention, the primary reference Akkapeddi and similar references addresses the issue of two-dimensional spatial phase conjugation for communicating through the atmosphere but is based on different physical phenomenology as opposed to Applicant’s invention (i.e., Akkapeddi does not suggest or disclose the claimed **broad area, intra-cavity** electrically pumped micro-phase conjugator described by Applicant). Nonetheless, the proposed modification in the examiner’s rejection, i.e., taking the system described in Vasil’ev and simply replacing Akkapeddi’s nonlinear crystal phase conjugator and Raman amplifier with Vasil’ev’s self-pumped non-collinear broad area semiconductor laser diode (SLD) in an external cavity configuration, would render the system in Akkapeddi inoperable because the proposed modification **would not** produce a *spatially* phase conjugated beam to **remove atmospheric distortions**. Such an effect is produced by Applicant’s claim 1 invention (See Applicants specification, page 19, lines 7-13) and is an intent, purpose, and function in Akkapeddi. By contrast, the Vasil’ev reference explicitly states on page

42, in the second to last paragraph of the article, that **the devices described in his article are not truly suitable for turbulence aberration correction**. Such a correction is important in Akkapeddi's invention. Again, the first line of the abstract in Akkapeddi states, "An improved adaptive optics system is disclosed for correcting atmospheric phase aberrations." Therefore, to combine the references and further arrange the phase conjugators in an array as taught by Pepper et al. would provide an array of inoperable devices for atmospheric distortion correction.

Accordingly, Applicant respectfully submits that there is nothing in any of the cited references to provide motivation in support of the combination of references cited, the references teach away from their combination, and furthermore, if combined, the combination of the references would render the modification inoperable. Therefore, the rejection of claim 1 under 35 U.S.C. §103(a) is deemed improper and is requested to be withdrawn.

Regarding dependent claims 9-14, 16, 17, and 45 which depend on claim 1. Under MPEP §2143.01, "If an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious." In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, the rejections of claims 9-14, 16, 17, and 45 under 35 U.S.C. §103(a) are deemed moot and are requested to be withdrawn.

Regarding method claims 40 and 41, the Examiner makes the same arguments as to the obviousness of the claims as made in the rejection of claim 1 under 35 U.S.C. §103(a) as discussed above. In light of similar arguments discussed above in the

rejection of claim 1 under 35 U.S.C. §103(a), the rejections of claims 40 and 41 under 35 U.S.C. §103(a) are additionally deemed improper and are requested to be withdrawn.

Discussion of Rejection of Claims 8 and 15 under 35 U.S.C. §103(a)

Claims 8 and 15, stand rejected under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi in view of Vasil'ev et al. and Pepper et al. as applied to claim 1 above, and further in view of Watanabe (US 5,920,588 A). The examiner states, "[I]t would have been obvious to a person of ordinary skill in the art to use a single gain stripe device as taught by Watanabe in the system describe by Akkapeddi in view of Vasil'ev et al. and Pepper et al. as an engineering design choice of a nonlinear medium for producing the phase conjugate beam already disclosed." Applicant respectfully traverses the rejection of claims 8 and 15.

The Watanabe work is based on the use of intracavity four-wave mixing and phase conjugation for the purpose of removing the effects of chromatic dispersion and pulse distortion in fiber communication systems and **not for producing a spatially conjugated beam**. For example Watanabe states, (See Column 16, lines 17-20), "An optical fiber 2 is optically connected through a lens 3 to a first end of a DFB laser diode 1, and an optical filter 10 is optically connected through a lens 6 and an optical fiber 4 to a second end of the DFB laser diode 1." As another example, Watanabe claims (See claim 63) "A device,...wherein said optical fiber has a zero-dispersion wavelength substantially equal to a wavelength of said pump light." Watanabe in essence teaches and claims an intra-cavity four-wave mixing in a single-mode DFB laser waveguide that would spatially filter an atmospherically aberrated input beam, destroying the spatial

information required to produce a spatially phase conjugated retro-beam. Such a device does not correct for atmospheric distortions as taught in Akkapeddi. Therefore, it is **not an engineering design choice** as stated by the examiner to use a single gain stripe as taught by Watanabe in the system described by Akkapeddi in view of Vasil'ev and Pepper et al. because to do so would make the Akkapeddi apparatus inoperable (i.e., it would not correct for atmospheric distortions). It thus necessarily follows that there would not be a motivation to combine Watanabe with Akkapeddi in view of Vasil'ev and Pepper et al. to have an array of such inoperable devices.

Accordingly, in light of similar arguments discussed previously regarding claim 1, in combination with the arguments against the Watanabe reference, the rejection of claims 8 and 15 (which depend on claim 1) under 35 U.S.C. §103(a) are deemed improper and are requested to be withdrawn.

Discussion of Rejection of Claims 18, 19 and 21 under 35 U.S.C. §103(a)

Claims 18, 19, and 21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi in view Vasil'ev. The Examiner states that it would have been obvious to use the intra-cavity phase conjugator taught by Vasil'ev et al. in the system disclosed by Akkapeddi as a way to provide a phase conjugate light beam without requiring a separate source of pump light. Applicant respectfully traverses the rejections.

In light of similar arguments for the rejection of claim 1 under 35 U.S.C. §103(a), the rejection of independent claim 18 and dependent claims 19 and 21, which depend on claim 18, are deemed improper and are requested to be withdrawn.

Discussion of Rejection of Claims 20 and 46-49 under 35 U.S.C. §103(a)

Claims 20, and 46-49 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi in view of Vasil'ev and Pepper et al. as applied to claim 1 or Akkapeddi in view of Vasil'ev as applied to claim 18 and further in view of Watanabe. Applicant respectfully traverses the rejections.

Claim 20 depends on claim 18, claim 46 depends on claim 1, claim 47 depends on claim 46 which depends on claim 1, claim 48 depends on claim 18, and claim 49 depends on claim 48 which depends on claim 18.

In light of similar arguments for the rejections of claim 1 and claim 18 under 35 U.S.C. §103(a), the rejections of claims 20 and 46-49 under 35 U.S.C. §103(a) are deemed improper and are requested to be withdrawn.

Discussion of Rejection of Claims 22-23 under 35 U.S.C. §103(a)

As set forth above, **claim 22 and 23** stand rejected under 35 U.S.C. §103(a) as being unpatentable over Akkapeddi in view of Vasil'ev and Damen et al. (U.S. Patent No. 5,675,436 A). The examiner states that, "Akkapeddi et al. do not specifically disclose that the phase conjugator may be a broad area intra-cavity phase conjugator which is a VCSEL structure. However, as similarly discussed above with regard to claim 1, Vasil'ev et al. teach a broad area intra-cavity phase conjugator. Vasil'ev et al. further teach that the phase conjugator may be a semi-conductor laser diode but does not specifically teach that it may be a VCSEL structure." The Examiner then adds, "Damen et al. (Column 3, lines 37-61) teach that a VCSEL structure may be used to provide a nonlinear element for four wave mixing such as the laser device taught by Vasil'ev et

al...It would have been obvious to use the broad area intra-cavity phase conjugator which is a VCSEL structure taught by Vasil'ev et al. and Damen et al. in the system disclosed by Akkapeddi as a way to provide a phase conjugate light beam without requiring a separate source of pump light." Applicant respectfully traverses the rejections similar to arguments made in the rejection of claim 1 under 35 USC 103(a) above because: 1) the references Akkapeddi and Vasil'ev are not properly combinable or modifiable because their intended function is destroyed, 2) it is improper to combine references as cited by the examiner where the references teach away from their combination, and 3) based on argument 1 and 2, there would not be a motivation by one skilled in the art to make the combination or modification.

First, regarding claim 22, as discussed above in the rejection of claim 1 under 35 U.S.C. §103(a), the rejection is deemed improper because to combine the primary reference (Akkapeddi) with the secondary reference Vasil'ev renders Akkapeddi inoperable.

Second, Applicant respectfully submits, as similarly discussed above in the rejection of claim 1 under 35 U.S.C. §103(a) that it is improper to combine references where the references teach away from their combination as mandated under MPEP §2145 (X)(D)(2). In the rejection of claim 22, the Examiner seeks to combine the secondary reference Vasil'ev with the semi-conductor laser (i.e., a VCSEL) as taught in the other secondary reference, Damen et al., and implemented into Akkapeddi. However, as previously stated, Vasil'ev teaches away from using semi-conductor lasers (i.e., a VCSEL as taught by Damen et al.) for turbulence aberration correction, which is

an important aspect of Akkappedi. Moreover, Vasil'ev teaches that **SLD's** (i.e., **Semiconductor Laser Diodes** which includes VCSEL's) **are not suitable for turbulence aberration correction**. For example, on page 42, in the second to last paragraph of the Vasil'ev reference article, the authors state, "It should be noted that strictly speaking the "conjugate" signal generated is not the "phase conjugate" of the input beam, because of the "filtering" action of the waveguide of the SLD. In view of this SLD's are not truly suitable for turbulence aberration correction....."

Third, based on the foregoing arguments, there is no motivation to combine or modify the references as mandated under MPEP §2143.01 in order to make Applicant's invention.

Therefore, Applicant submits that it is improper to combine the primary reference Akkapeddi with Vasil'ev and Damen et al. as because: 1) The device in Vasil'ev would make the Apparatus of the primary reference (Akkapeddi) inoperable, 2) it is improper to combine the primary reference Akkapeddi with Vasil'ev and Damen et al. as because Vasil'ev teaches away from using the device as taught by Damen et al. as well as for the application as taught in Akkapeddi and 3) there is no motivation in the references based on the foregoing arguments to combine or modify the references to make Applicant's invention.

Accordingly, the rejection of claim **22** and dependent claim **23**, which depends on claim **22** is believed improper and is requested to be withdrawn.

Discussion of Rejection of claims 24, 26-33 under 35 U.S.C. §103(a)

Claims 24, 26-33 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Watanabe in view of Vasil'ev et al. and MacDonald (U.S. Patent No. 5,519,723 A). The Examiner states that, "Watanabe discloses an optical interconnection system (Figure 2) comprising: a fiber device (fiber 2) constructed to transmit an interrogating beam (ω_s) to a predetermined intra-cavity phase conjugator 1." In addition, the examiner states that, "[i]t would have been obvious to a person of ordinary skill in the art to use a mirror taught by MacDonald in the system disclosed by Watanabe....[i]t would have been obvious to a person of ordinary skill in the art to use the broad area phase conjugator taught by Vasil'ev et al. as the phase conjugator in the system suggested by Watanabe in view of MacDonald as an engineering design choice of a phase conjugating medium." Applicant respectfully traverses the rejection.

Applicant respectfully submits that the rejection fails the obviousness test because there is no teaching, suggestion or motivation as mandated under MPEP §2143.01 (as shown in the rejection of claim 1) to combine Watanabe in view of Vasil'ev et al. and Macdonald to make Applicant's claimed invention. Watanabe, as discussed above in the rejection of claims 8 and 15 under 35 U.S.C. §103(a), spatially filters an atmospherically aberrated input beam and thus destroys the spatial information required to produce a spatially phase conjugated retro-beam. It necessarily follows that such a device does not correct for atmospheric distortions as Applicant's claimed invention. Vasil'ev, as stated repeatedly in arguments against several of the rejections above, teaches away from using his devices for atmospheric turbulence correction.

Therefore, it is not an engineering design choice as stated by the examiner to use the device taught in Vasil'ev as the phase conjugator suggested in Watanabe because to do so would make Applicant's apparatus inoperable with or without the mirror taught in MacDonald (i.e., it would not correct for atmospheric distortions).

Accordingly, there is no teaching, suggestion, or motivation for combining the references cited by the Examiner to make Applicant's claimed invention. Therefore the rejection of claim 24 and dependent claims 26-33, which depend on claim 24 are deemed improper and are requested to be withdrawn.

Discussion of Rejection of claim 25 under 35 U.S.C. §103(a)

Claim 25 stands rejected under 35 U.S.C. §103(a) as being anticipated by Watanabe in view of Vasil'ev and MacDonald and further in view of Damen et al. In light of the above arguments for the rejection claim 24, the rejection of claim 25 under 35 U.S.C. §103(a) which depends on claim 24 is deemed moot as mandated by MPEP §2143.01, "If an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious." In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, the rejection is requested to be withdrawn.

Discussion of Rejection of claims 34 and 35 under 35 U.S.C. §103(a)

Claims 34 and 35 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sharp et al. in view of Vasil'ev et al. This rejection is respectfully traversed.

Regarding claim 34, the Examiner states: "Sharp et al. do not specifically disclose that the means for returning a phase conjugate beam is a broad area intracavity phase conjugator, but Vasil'ev et al. teach a broad area intracavity device for returning a phase

conjugate beam such as disclosed by Sharp et al.” She then states, “[i]t would have been obvious to a person of ordinary skill in the art to use a broad area intracavity phase conjugator taught by Vasil’ev et al. in the system disclosed by Sharp et al. as an engineering design choice of a way to provide a phase conjugate beam without requiring a separate source of pump light.”

Applicant respectfully submits that **the references** cited by the Examiner **do not disclose or suggest** a teaching, explicit or implied, that would provide a motivation for one skilled in the art to combine or modify the primary reference (Sharp) with the secondary reference (Vasil’ev) in order to produce Applicant’s broad area phase conjugator.

Under MPEP §2143.01, “[o]bviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art.” *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The primary reference (Sharp) teaches a phase conjugation arrangement that utilizes a **photorefractive material**, two external pump sources coupled with optical modulators to provide the encoding necessary to provide the gratings established in the photorefractive materials while the opposite pump sources read the gratings and supply the energy for the production of the conjugate wave. As opposed to Applicant’s one source, Sharp et al. states, (lines 28-30, Column 3), “Both output beams 11 and 12 are required for either conjugate to exist and the energy for the conjugate of one beam is

supplied by the other beam.” Applicant respectfully submits that one skilled in the art would not look to combine with or modify such an application by Sharp because, while Sharp does correct for atmospheric turbulence, the technique is based on different phenomenology and as a requirement needs to use two external pump sources (unlike Applicant’s) to operate. In addition, one skilled in the art would not look to combine or modify Vasil’ev with Sharp because Vasil’ev explicitly states that his device would not be suitable for atmospheric turbulence correction (as taught by Applicant), as opposed to photorefractive crystals (as disclosed by Sharp). For example once again, in the Vasil’ev reference on page 42, in the second to last paragraph of the article, (but adding the final verbiage of the statement), the authors state, “It should be noted that strictly speaking the “conjugate” signal generated is not the “phase conjugate” of the input beam, because of the “filtering” action of the waveguide of the SLD. In view of this SLD’s are not truly suitable for turbulence aberration correction as opposed to Na vapour or photorefractive crystals.”

Accordingly, because photorefractive materials in phase conjugation applications such as that taught by Sharp et al. are suitable for turbulence aberration correction but is taught away by Vasil’ev, Applicant submits that one skilled in the art would not be motivated to look to a device as taught by Vasil’ev to combine or be modified with Sharp, and it would not merely be an engineering design choice as stated by the examiner, because the combination or modification would not correct for turbulence aberrations as taught by Applicant. Therefore, the rejection of claim 34 under 35 U.S.C. §103(a) is deemed improper and is requested to be withdrawn.

Regarding claim 35, the Examiner makes similar arguments in the rejection of Applicant's claimed broad area phase conjugator in claim 35 that were made in the rejection of claim 34. In light of similar arguments that were made for the rejection of claim 34, the rejection of claim 35 under 35 U.S.C. §103(a) is also deemed improper and is requested to be withdrawn.

Discussion of Rejection of claims 36-39 under 35 U.S.C. §103(a)

Claims 36-39 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sharp et al. in view of Pepper et al. and Vasil'ev et al. This rejection is respectfully traversed.

The examiner makes similar arguments in her rejection of claims 36-39 as were made in the rejection of claims 34 and 35 under 35 U.S.C. §103(a) but adds the reference (Pepper et al.) and states that Pepper et al., "teach that a plurality of phase conjugators arranged in an array may be used in a system to produce a phase conjugate beam as in the method disclosed by Sharp et al." The examiner also states that "it would have been obvious to a person of ordinary skill in the art to specifically use a broad area intracavity phase conjugator as Vasil'ev et al. teach in the method disclosed by Sharp et al. as a known engineering choice..."

In light of similar arguments against combining the Sharp and Vasil'ev references, (whether or not arranged in an array as Pepper et al. teach as asserted by the Examiner), in the rejection of claims 34 and 35 under 35 U.S.C. §103(a), the rejection of independent claim 36, and dependent claims 37-39 which depend on claim 36 is requested to be withdrawn.

Discussion of Rejection of claims 42-44 under 35 U.S.C. §103(a)

Claims 42-44 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pepper et al. in view of Vasil'ev. This rejection is respectfully traversed. The Examiner states, "Pepper et al. do not specifically disclose a broad area intracavity phase conjugator, but Vasil'ev et al. teach a broad area intracavity phase conjugator." The Examiner then states, "[i]t would have been obvious to a person of ordinary skill in the art to use the phase conjugator taught by Vasil'ev et al. as the phase conjugator in the system disclosed by Pepper et al. as an engineering design choice..."

Regarding claim 42, Applicant respectfully submits that the rejection of claim 42 fails the obviousness test as mandated by MPEP §2143.01 (as shown in the rejection of claim 34 above), and is not merely an engineering design choice as stated by the Examiner because the device as taught by Vasil'ev, if combined or modified with the primary reference Pepper, would defeat a key feature of Applicant's invention (i.e., to correct for atmospheric aberrations). Applicant submits that one skilled in the art would not be motivated to look to a device as taught by Vasil'ev to combine or be modified with Pepper, and it would not merely be an engineering design choice as stated by the examiner, because the combination or modification would not correct for turbulence aberrations in a broad area intracavity phase conjugator as taught by Applicant.

Accordingly, the rejection of independent claim 42 under 35 U.S.C. §103(a), and dependent claims, 43 and 44, which directly or indirectly depend on claim 42, is deemed improper and is requested to be withdrawn.

Reconsideration Requested

The undersigned respectfully submits that, in view of the foregoing amendment and remarks, the rejections of the claims raised in the Office Action dated November 20, 2002 have been fully addressed and overcome, and the present application is believed to be in condition for allowance. It is respectfully requested that this application be reconsidered, that these claims be allowed, and that this case be passed to issue. In the event that the Examiner finds any remaining impediment to the prompt allowance of these claims that can be clarified with a telephone conference, she is respectfully requested to initiate the same with the undersigned at (925) 422-3682.

Respectfully submitted,



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Livermore, California
Dated: 2/20/03

VERSION WITH MARKINGS TO SHOW CHANGES MADE

18. (Three Times Amended) A system comprising:

a transceiver constructed to transmit an interrogating beam;

a communication station capable of receiving said interrogating beam;

and

said communication station having a broad area, intra-cavity phase conjugator with a top electrode, wherein an [electrode] aperture is located in said top electrode.